

Comments Submitted
to the
California Energy Commission's Energy Efficiency Committee
Public Hearing
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By

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Introduction

The Cool Metal Roofing Coalition was formed in 2002 by the American Iron and Steel Institute (AISI), Metal Building Manufacturers Association (MBMA), Metal Construction Association (MCA), National Coil Coating Association (NCCA), and Zinc Aluminum Coaters Association (NamZAC). The Coalition's mission is to educate architects, building owners, specifiers, code and standards officials and other stakeholders about sustainable, energy-related benefits of cool metal roofing.

We appreciate the opportunity to address the Energy Efficiency Committee through this hearing. Specifically, we wish to raise concerns about the cool roof provisions of the proposed California Energy Code Title 24. We understand that these provisions are intended to reduce energy consumption and conserve energy resources, which are highly laudable goals. However, we do not feel that all the pertinent energy and environmental factors have been considered, and the potential code-induced shift from metal roofing to other forms of roof construction could actually increase energy consumption, waste energy resources, and adversely affect the environment.

As stated by Commissioner Pernell in the Staff Workshop of the October 22, 2001, meeting of the California Energy Commission, "We are not looking to put any industry out of business. As a matter of fact, we want to be able to enhance the building industry, the consumers that buy the buildings and the various products, as well as have a benefit to the state." The Cool Metal Roofing Coalition believes that the metal roofing industry would be seriously harmed in the State of California if the proposed Energy Code were adopted as currently written. In addition, the consumer would be denied certain energy, environmental, and functional benefits of metal roofing.

The Metal Building and Roofing Industry in California

Metal building shipments to California by members of MBMA totaled over \$100 million in 2002. It is estimated that the remainder of the metal building industry shipped an additional \$50 million, representing total building shipments of \$150 million in 2002.

Using an average delivery price of \$5.15/ sq.ft. for the complete metal building system, the industry shipped over 29,000,000 sq.ft. of buildings with metal roofs to California. It is further estimated that 95% of the total square footage of the metal roofing in-state is low slope roofing (less than 2 on 12 slope).

In-place construction costs for building shipments are estimated at 20% of the total project cost, meaning that industry shipments of \$150 million actually translated into \$750 million in total construction value within the state in 2002. The proposed changes to the Energy Code can be expected to have a significant impact on this substantial market segment.

It is estimated that 90% of the metal building systems supplied for building projects within the state of California use unpainted steel roofing, coated with an Aluminum-Zinc Alloy. Only 10% of the projects have a painted roof system.

There are several major plants located throughout California that produce metal roofing and metal building systems, employing hundreds of workers, in addition to the construction trades involved with the projects. There are steel mills located in California as well.

Metal Roofs are Penalized by the Proposed Cool Roof Provisions

Metal roofs stand to be potentially harmed in several ways. Metal roofs can be either painted or unpainted. Typically, for low slope applications (primarily targeted by the California Energy Code cool roof provisions) metal roofs are unpainted. Metallic coatings have been developed and improved over the years for the very purpose of not requiring the expense of a painted coating. Producing a metal roof from a prepainted steel coil would increase the cost of the metal roof by around \$0.25 per square foot. And, keep in mind that a metallic coating is still required before the paint is applied to the steel coil to provide the necessary corrosion protection. Therefore, if the cool roof provisions require a normally unpainted metal roof to be painted, the cost impact could have serious competitive ramifications regarding the selection of a metal roof, or a metal building with a metal roof.

The prescriptive requirements for cool roofs in the proposed Energy Code call for an initial solar reflectance (ρ_{initial}) of 0.70 and an initial thermal emittance ($\epsilon_{\text{initial}}$) of 0.75. There is also an allowance for a low emittance cool roof if the initial reflectance is greater than $0.70 + 0.34(0.75 - \rho_{\text{initial}})$. This low emittance cool roof provision was specifically included for metallic coated roofs, but as it stands, typical metal roofing would not achieve the required reflectance, given measured values of ρ_{initial} .

The procedure for developing the criteria for low emittance cool roofs assumes that the degradation of the initial reflectance is the same for all roof materials, i.e.,

$$\rho_{\text{aged}} = \rho_o + c(\rho_{\text{initial}} - \rho_o)$$

where,

$$\begin{aligned}\rho_o &= 0.2 \\ \rho_c &= 0.7\end{aligned}$$

We wish to point out that this assumption ignores one of the key advantages that a metal roof provides. The degradation in the reflectance for a metal roof has been demonstrated to be potentially much less than other cool roofing materials. As a matter of fact, field tests at Oak Ridge National Laboratory and other sites [2] have shown that painted metal roofs lost only 5% of their initial reflectance in a 3-year environmental exposure. Likewise, unpainted metal roofs (e.g. acrylic coated Galvalume) have lost only 10% of initial reflectance over a 3-year environmental exposure. This is contrasted with some roofing materials that demonstrated as much as a 30% degradation of reflectance in the first year, as reported in [3]. In addition to the slower degradation of reflectance, unpainted metal roofs have typically demonstrated an increase in emissivity with time.

To demonstrate the impact that this would have on the cool roof properties, a comparison can be made between a theoretical unpainted metal roof and a theoretical membrane roof material with representative properties as follows:

Unpainted Metal Roof

initial = 0.70

initial = 0.10

10% loss of initial

Membrane Roof Material

initial = 0.70

initial = 0.75

30% loss of initial

Using the same calculation method as presented in the Code Change Proposal submitted to the Commission by Pacific Gas and Electric [1], the temperature of each roof can be determined. For the data above, the unpainted metal roof would have an aged roof temperature, $T_{cool,aged} = 150^{\circ}\text{F}$, and the membrane roof material would have $T_{cool,aged} = 145.5^{\circ}\text{F}$. It would only take an emissivity, $\epsilon = 0.20$ (either from a higher initial value or an improved aged value), to give virtually the same cool roof temperature ($T_{cool,aged} = 146^{\circ}\text{F}$).

This comparison shows that a roof that would not currently qualify under the prescriptive requirement (the unpainted metal roof), could have essentially the same long term cool roof properties, as exhibited by the roof temperature calculations used in drafting the proposed standard, as a roof that is acceptable. Given this reasonable comparison, with regard to the assumptions taken, we strongly suggest that this is not a sound basis for imposing a code provision that would tend to eliminate a roofing product from the marketplace when both products have the same impact on the energy needed to cool the building. Considering the virtually identical performance and the other significant benefits outlined below that metal roofing provides, this cannot be a prudent decision.

In addition to this potential inconsistency in labeling roof materials “cool” or not, we feel that whatever final prescriptive provisions are adopted should use the same initial reflectance that has been adopted by EPA Energy Star, i.e. $\rho_{initial} = 0.65$. There is the

potential for significant confusion in the marketplace regarding the different energy code requirements that are emerging and this confusion may in fact harm metal roofing.

We also think that the decision to use the same prescriptive cool roof requirement in all 16 California climate zones is a simplification that negates the potential benefits that a less emissive roof provides in decreased consumption of building heating energy in the colder regions of the state. As pointed out in the Code Change Proposal submitted to the Commission by Pacific Gas and Electric [1], an environmental concern “is the potential for cool roofs to increase gas-furnace emissions into local air districts where winter air pollution may be problematic. That is, if a building is cooled with remotely generated electric power, and heated with locally burned natural gas, installation of a cool roof may yield increased annual local emissions even while reducing annual energy consumption.” This concern would be alleviated if a cool roof with a low emissivity were specified.

We are aware that the proposed Energy Code provides a performance approach in lieu of the prescriptive requirements. However, it does not appear that the Energy Budget method is permitted unless the cool roof meets the prescriptive requirements for reflectance and emittance values. This would currently preclude its use for unpainted metal roofs. We are in the process of soliciting proposals [4] to assess if and how these performance procedures could be used and the resulting impact on the overall building performance and cost.

Other Benefits of Metal Roofs That Should be Evaluated

We wish to bring to your attention that the selection of cool roofing materials solely on the basis of their reflective and emissive performance may overlook certain energy and environmental consequences. Specifically, metal roofing should be recognized and valued for its ancillary energy and environmental benefits, outlined as follows.

Metal roofing has a minimum of 25% recycled content and is 100% recyclable at end of life. This means that energy was saved in the process of making metal roofing and that additional energy will be saved when future products are made from roofing materials that have been demolished for recycling. Few, if any other materials can make similar, credible claims.

Metal roofing materials are not relegated to disposal in landfill at end of life, thus saving valuable landfill space. Instead, through recycling, these materials are diverted from the solid waste stream to become new recycled content products that provide value to society in future generations.

Metal roofing materials are strong, durable, and dimensionally stable, thus affording them a very long service life, surviving the time span of numerous decades and the extremes of weather, including temperature, wind, rain, and hail. This means that the cost and energy of more frequent installation of replacement roofing is avoided, as well as the cost and energy of manufacturing replacement roofing and transporting it to the job site.

Metal roofs are also one of the lightest roofing materials available, which means seismic loads are lower at the most critical building location. Thus, metal roofs are seismic-friendly and a significant benefit for California and other areas of high seismicity.

The surface characteristics of metal roofing materials tend to naturally shed airborne contaminants rather than retain them. This means that the reflective and emissive properties of metal roofing can perform longer without significant depreciation as detailed below. In addition, the cost and energy of supplemental cleaning that might otherwise be required is avoided, as well as any relevant air quality issues from cleaning materials.

Metal roofing materials do not support combustion; therefore, the risk of the outset or the spread of fire can be reduced. This means that personnel are better safeguarded and that the cost and energy to replace destroyed or damaged plant and property is less likely to be required.

It is believed that the above energy and environmental contributions made by metal roofing in fact complements its cool roofing performance and should be given due consideration by the Commission.

The Proposed Energy Code is Too Complex

In the process of evaluating the impact that the proposed Energy Code would have on metal roofs and metal buildings, concerns were raised with how difficult it is to read and interpret. Most codes are targeted to an audience of building officials, architects, specifiers, contractor community, etc. It seems one must be an expert consultant in energy matters to understand what the requirements really are, and the experts themselves may interpret various aspects differently. We see the potential for enormous confusion and misunderstanding as to the actual requirements, all of which may harm metal roofing.

For example, it is not sufficiently clear whether the prescriptive cool roof requirements apply to unconditioned buildings. What about an unconditioned manufacturing building with a conditioned office space? Is it clear that the prescriptive cool roof requirements would not apply to the unconditioned manufacturing building? Important issues like this should be more clearly spelled out.

CRRC Should Not be the Only Recognized Testing Authority

The Members' Associations of the Cool Metal Roof Coalition have been participants in the Cool Roof Rating Council activities. However, we do not agree with the proposed policy that would not permit the use of independently certified test results. To only allow test results from CRRC accredited independent testing agencies introduces the potential for much greater cost. Many member companies of the Cool Metal Roof Coalition have high-quality ISO certified test laboratories. Any test laboratory that meets the same administrative requirements spelled out in the Energy Code should be permitted.

Metal roofing and metal building manufacturers are subject to numerous building code requirements that satisfactorily invoke ASTM test requirements. Cool roof properties

should not be held to a seemingly arbitrary higher scrutiny, in only being permitted from CRRC certified laboratories, any more than the structural and mechanical ASTM test properties of steel for seismic performance and public safety.

Summary

We appreciate your time and interest in these very important matters, not only for the metal roofing industry but also for the citizens of California. We want the public interest to be best served and part of that service is the reliable, durable, and ever-improving cool metal roof. We believe metal roofing should be held to standards that are in fact reasonable and fair for all competing systems, as we have outlined. Metal roofing is a superior all-around performer for building systems and we believe that it should not be disadvantaged or grievously driven from business in California. We welcome any questions you may have and ask that you include the metal roofing industry appropriately in the Code development process as it goes forward.

References

1. *Inclusion of Cool Roofs in Nonresidential Title 23 Prescriptive Requirements*, Code Change Proposal, Pacific Gas and Electric Company, August 2002.
2. Miller, W.A., Parker, D. S., and Akbari, H., *Painted Metal Roofs are Energy-Efficient, Durable and Sustainable*, presented at New Roofs for a New Century conference, New York City, New York, April 7-8, 2003.
3. *High Albedo (Cool) Roofs*, Code and Standards Enhancement Study, Pacific Gas and Electric Company, November 17, 2000.
4. Request for Proposal: Metal Roofing in California – An Analysis of the Proposed 2005 Energy Code, Cool Metal Roofing Coalition, August 26, 2003.